The Nutritional Status of the Aging

Public Health Aspects

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SUMMARY

In preliminary analysis of nutritional, physical and laboratory data obtained in a study of 577 persons 50 years of age and over in San Mateo County, a number of factors of possible significance were noted.

Of the 577 persons examined, 243 were referred to private physicians for a total of 377 conditions requiring attention.

Obesity and hypertension were the most common causes for referral. More women than men were overweight. Anemia was noted more often in women than in men. Serious anemia was of higher incidence in the higher age brackets. In a number of cases in which there was high glucose content in the blood there was no trace of sugar in the urine.

Abnormally low content of ascorbic acid in the blood was of high incidence among persons of low income, of lesser incidence in the middle income group, and did not occur in persons in the high income group.

THERE is obvious need for research in the field of human nutrition in our aging population, since this group is ever increasing in the total population. Very little is known of the physiological mechanisms involved in the aging process nor is it clearly understood what is meant by pathological changes in contrast to the so-called inevitable normal involutionary changes. Certainly, it may be hoped that as new scientific facts are gathered people may not only lead a longer, but also a more functionally active and socially useful life.

Available scientific evidence suggests that dietary inadequacies and malnutrition of varying degrees are of frequent occurrence in the United States and that the nutritional status of an appreciable part of the population can be distinctly improved. Animal experimentation indicates that length of life, as well as functional efficiency, can be considerably enhanced by more adequate nutrition. To promote optimum human nutrition and health more scientific knowledge is required regarding the nutritional needs of and the nature of the characteristic changes in the aging.

From the San Mateo County Department of Public Health and Welfare.

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This presentation is a preliminary report on a joint cooperative research project* carried out in San Mateo County during the year 1948-49 by the U. S. Bureau of Human Nutrition and Home Economics, the U.S.P.H.S., the Department of Home Economics of the College of Agriculture of the University of California, the California State Department of Public Health, and the Department of Public Health and Welfare of San Mateo County, with the cooperation of the San Mateo County Medical Society.

Objectives: The Western Agricultural Experiment Stations, the U. S. Bureau of Human Nutrition and Home Economics and the United States Public Health Service have established long-term objectives for a five-year study of human nutrition, of which the present study was only one phase. The immediate local objectives were fivefold:

1. To collect information on etiologic aspects and the prevalence of deficiency and degenerative diseases in the aging in San Mateo County.

2. To determine the relationship between nutritional status and the degenerative diseases of the aging.

3. To test, develop and apply methods of assessing human nutrition and health status in the aging.

4. To develop procedures effective in the correction of nutritional deficiencies and other diseases discovered by the health appraisal.

5. To present to the physicians and the community at large information regarding nutrition in the aging.

With the nearly total lack of knowledge regarding nutrition in the aging and such broad objectives, it is obvious that the techniques used were necessarily of the shotgun variety—that is, instead of a study of any one nutritional factor exhaustively, a very broad approach was made to the problem in hopes that later statistical analyses would reveal certain clues or correlations worthy of more detailed study.

The procedure was as follows:

1. Recruitment and selection of persons for study.

2. Examination, including detailed nutritional and medical history, physical examination, and laboratory studies.

*Although each of the agencies made contributions to the project in either kind of service, the principal source of support came from an annual $40,000 grant made by Congress to the eleven Agricultural Experiment Stations of Western States for research in human nutrition. As this was a research project and not an administrative or case-finding study, no attempt has been made to determine the actual case costs; but for known cash outlays it averaged about $110 per case completed.

3. Referral to private physicians of persons with detected abnormalities.

4. Tabulation and analysis of data.

Recruitment and Selection. As all persons studied were volunteers, a publicity campaign was conducted to reach the population in the age groups under study, with the close cooperation of the press, radio, voluntary health agencies, churches, labor organizations, lodges, luncheon clubs and other social organizations. All persons selected for study were 50 years of age or over, were residents of San Mateo County, were physically and mentally capable of participating, were not on any special diet, and had not been under the care of a private physician within the previous three months.

Eight hundred and forty-three persons registered; studies were completed on 577 persons selected from the registrants. Although the sample was random in order to facilitate statistical analyses, efforts were made to obtain:

1. An equal number of males and females (final count 280 males and 297 females).

2. As nearly as possible an equal number of participants from each age group. This was impossible, the final distribution being as follows:

Age Group (years)	Number	Percentage of Total
50-59	192	33.2
60-69	215	37.3
70-79	137	23.8
80-89	33	5.7

3. A sample from all economic groups. The distribution was as follows: County institution, 47; low economic, 59; middle economic, 445; upper economic, 24; unknown, 2.

4. A reasonable geographic distribution. In addition to the participants examined at the Crystal Springs Home, the unit was stationed during different periods of the study in the far north of the county (Daly City), in the central part of the county (Burlingame), and in the southern part of the county (Redwood City). The distribution of participants by area was as follows: Crystal Springs Home, 48; Daly City, 72; Burlingame, 311; Redwood City, 146.

Examinations.

1. Nutritional history was divided in two parts:
   Part A was a seven-day record kept by the participant of everything he ate after a detailed conference with the nutritionist.
   Part B was a general food history elicited by the nutritionist covering the participant's general food habits over the years.
2. Medical history was also done in two parts:
   Part A was a general medical history of the patient's previous diseases and medical care.
   Part B was a detailed history relative to physiologic systems.
3. The physical examination consisted of the procedures followed in the usual careful clinical examination plus an assessment of nutritional status by physical signs, as outlined in the Manual for Nutritional Appraisal of the United States Public Health Service.
4. The laboratory procedures consisted of the following determinations:
   (a) Blood—Hemoglobin, serum protein, sedimentation rate, packed red cell volume, glucose, ascorbic acid, Vitamin A, carotene, nonprotein nitrogen, cholesterol (free), cholesterol total, leukocyte count with cell differential, erythrocyte count, and tests for presence of organisms.
   (b) Urine—glucose, albumin.
   (c) Chest x-ray.
   (d) Bone density determination (Method of Dr. P. B. Mack).
   (e) Vaginal Papanicolaou smears for women.

Referral to private physicians. As soon as possible after completion of the examinations, a summary was prepared for each patient and a letter sent informing him or her that (1) no conditions were discovered requiring medical care at the time, or (2) that he or she was in need of medical care. If the participant indicated the name of a physician in private practice, a complete summary was sent to the physician, and, if abnormal conditions had been found, the information that the patient was being referred. If no physician was indicated by the participant, he was asked to designate a physician, and a complete summary was sent to the physician indicated. Of the 577 persons examined, 243 (42.1 per cent) were referred to private physicians. Some of those referred had more than one of the conditions requiring the attention of a physician; there were 377 such conditions in the 243 persons referred.

Condition	Number of Instances	Percentage of 377 Instances
Hypertension	120	31.8
Obesity	101	26.8
Serologic evidence of disease	7	1.8
Cardiac abnormality	17	4.5
Anemia	14	3.7
Hyperglycemia	14	3.7
Albuminuria	29	7.7
Glycosuria	17	4.5
Cervical polyps	5	1.3
Cervical erosion	6	1.6
Other	47	12.5

In the 297 women examined, no case of malignant disease was detected by the Papanicolaou test. No case of tuberculosis was detected in the 577 chest x-rays.

As hypertension and obesity were by far the most common causes for referral, a simple association table was compiled (Table 1).

Of the males, 13.6 per cent were overweight, while 16 per cent of the females were overweight —not a significant difference, but suggestive. Of persons under 65 years of age, 17.5 per cent were overweight while 12.1 per cent of those over 65 were overweight. This might suggest that perhaps those in the older age brackets who are overweight do not live into the 65 plus age group.

TABLE 1.—*Incidence of Overweight and of Abnormally High Systolic Blood Pressure*

	O.W.†	—O.W.‡	Total
Sex:			
Male	37(13.6%)	234	271
Female	47(16%)	246	293
Total	84(14.9%)	480	564*
Age:			
65—	51(17.5%)	240	291
65+	33(12.1%)	240	273
Total	84(14.9%)	480	564*
Systolic blood pressure (mm. of mercury):			
200+	20(26.3%)	56	76
200—	64(13.1%)	424	488
Total	84(15.9%)	480	564*

†O.W. = Overweight—16 per cent or more above calculated average weight for age and sex.
‡— O.W. = Not overweight.
*Data not complete on 13 participants.

Obesity and hypertension were definitely associated, as would be expected. Of the overweight participants, 23.8 per cent had a systolic blood pressure of 200 mm. of mercury or more, while only 11.6 per cent of those who were not overweight had systolic pressure of that order.

There was little difference between the males and females as to hemoglobin content of the blood, but the incidence of anemia was slightly higher in females than in males. With anemia considered to exist if the hemoglobin content was 11 gm. or less per 100 cc., 2 per cent of the females and 1.4 per cent of males were anemic. Serious anemia was more common in the older age groups.

Age Group	% of Participants with Less Than 11.0 gm. Hemoglobin per 100 cc.
50-59	1.04
60-69	.93
70-79	3.15
80-89	4.16

The relationships between high content of sugar in the blood and sugar in the urine were of interest. In this regard, any specimen of urine with a trace of glucose or more was considered "positive"; blood containing 160 mg. per 100 cc. within two hours after a meal or as much as 130 mg. more than two hours after a meal was considered "positive." Forty-four persons had urine positive for sugar, and 35 had "positive" blood. Only 31.8 per cent of those with "positive" urine had "positive" blood, while 3.9 per cent of persons with urine negative had blood positive for sugar. This would indicate that in general surveys for diabetes, determination of the sugar content of the urine is not completely reliable. Of the 35 persons with blood positive for glucose, 21 (60 per cent) had not even a trace of sugar in the urine.

The final phase of this study—tabulation and analysis of the data—is not yet completed. When it is, answers to some of the following questions may be found:

1. Are the accepted "normal ranges" for the various blood constituents valid in the older age groups?
2. What is the relationship between food cholesterol or fat intake and the blood cholesterol level?
3. Is the bone density in old age correlated with calcium/phosphorus intake, sun exposure, Vitamin D intake, protein intake or any other measured factor?
4. Is there a correlation between the intake of protein or other nutrients and blood levels of nonprotein nitrogen, uric acid or creatinine.
5. Are any specific dietary elements correlated or associated with kidney disease, hypertension, cardiac disease, other degenerative diseases?
6. What dietary factors are correlated with high or low hemoglobin levels in elderly persons?
7. Do high Vitamin A intake or high ascorbic acid plasma levels favorably affect the health?

In relation to Question 7, some data are now available. The results of the blood analyses for ascorbic acid were analyzed in relation to the economic status of the persons studied (Table 2). Assuming ascorbic acid content below 0.5 mg. per 100 cc. to be abnormal, it was found that 87 per cent of the institutional patients fell in this range, 41.7 per cent of the low economic group in the general population, 20 per cent in the middle economic group and none in the high economic group. There is an apparent correlation between economic status and ascorbic acid blood levels. At the Crystal Springs Home either the food provided for the kitchen does not contain sufficient Vitamin C or else the food is so cooked that part or all of the Vitamin C is destroyed. It might be assumed that those who can afford a good diet naturally include adequate Vitamin C in their diet.

TABLE 2.—*Ascorbic Acid Content in Blood of Aged Persons of Various Economic Groups*

Blood ascorbic acid mg. per 100 cc.:	Total	Pension and Relief			General Population		
		C.S.H.*	Low	Middle	Low	Middle	High
0.0 to 0.4	166(28.8%)	41(87.2%)	12(52.1%)	14(31.8%)	15(41.7%)	82(20.4%)	0
0.5 to 0.8	128(22.2%)	3(6.4%)	4(17.3%)	10(22.7%)	15(41.7%)	93(23.2%)	3(12.5%)
0.9 and over	274(47.5%)	1(2.1%)	7(30.4%)	19(43.2%)	6(16.6%)	221(55.1%)	20(83.3%)
Unknown	9(1.5%)	2(4.3%)	0	1(2.3%)	0	5(1.3%)	1(4.2%)
Total	577	47	23	44	36	401	24

*Crystal Springs Home.